



1.
Introduction

Grasses are very important group of plants not only to human beings but also to animals. Grass species are most of the world's major food crops, including wheat, barley, oats, rice, maize, millets, sugarcane and pasture species. Grasses are also very important use as hay, so that various species cultivated in hay fields and for pastures. Many tall grasses, such as Bamboos are used as good construction material and plumbing as well as good raw material for the paper and various other things. Tuft and ornamental grasses are appreciated for their durability and beauty throughout the work. Apart from that grasses are used as a green fodder which the most important factor responsible for the success of animal husbandry. Natural grasslands play an important role in supplying fodder to the animals. These fodder grasses are known as palatable grasses. *Dicanthium annulatum*, *Bothriochloa pertusa*, *Sehima nervosum*, *Sehima sulcatum*, *Chrysopogon fulvus* are highly palatable grasses while *Ophiuros exaltatus*, *Desmostachya bipinnata*, *Heteropogon contortus*, *Imperata cylindrica*, *Aristida adscensionis*, *Aristida funiculata*, *Dinebra retroflexa* are unpalatable grasses (Gandhi *et al.*, 2011). Other than this, few grasses are used by humans as food. *Paspalum scorbiculatum* grains and flour are used by tribals (Gandhi *et al.*, 2011).

Grass species are ubiquitous on earth, occurring in ecosystems on every continent and when they form grasslands, they have a major influence on climate through the cycling of carbon and water between soils and the atmosphere. The influence of climate on grasses therefore lies at the heart of several important scientific problems, including the evolution of grasses and grasslands. The effect of climate change on these ecosystems over the coming decades and the resulting future impacts on food security and biodiversity (Osborne, 2009).

The grasses show high adaptability with respect to changing environments, the ability to coexist with grazing animals and with man. They have endless variations with distinct life forms. Grasses grow, reproduce and die back in one short season. Great emphasis is perforce on reproduction, i.e. seed production. The plant body is just a few thin leaves; one or two stems, but the inflorescence that weighed as much as the rest of the plant producing large number of seeds. Clearly, these are organisms whose success lie in their ability to grow when conditions are right. Since the proper conditions for growth and reproduction may be limited to a few short weeks, the grasses have evolved to reproduce as quickly as possible and this makes them one of the most successful terrestrial life forms on the earth (Gosavi, 2010).

Grasslands are areas where the vegetation is dominated by grasses; sedges and other herbaceous species like the legumes. Grasslands extend over 24 per cent of the world's vegetation (Shantz, 1954), however, prior to the impact of man and domesticated animals, its extension was approximately 40 per cent. In Asia the grassland accounts for 20 per cent of land cover (Premadasa, 1990). In India, grasslands constitute one of the major biomes. All the natural and semi-natural grasslands maintained by livestock / wildlife are collectively known as Rangelands. In India, 13,813 km² area of the land falls under this category (Singh, 1988). Between 1954 and 1962, the Indian Council of Agriculture Research (ICAR) conducted grassland surveys and classified the grass cover of India into five major types (Dabadghao and Shankarnaryanan, 1973).

- ***Sehima-Dichanthium* Type:** These are spread over the Central Indian plateau, Choto-Nagpur plateau and Aravalli ranges, covering an area of about 17,40,000 km². This region has an elevation between 300 and 1200 m. This is also a rich wildlife area, with a large number of protected areas, especially forest protected areas (sanctuaries and national parks).
 - ***Dichanthium -Cenchrus - Lasiurus* Type:** These are spread over an area of about 436,000 km², including northern parts of Delhi, Aravalli ranges, parts of Punjab, almost whole Rajasthan, and Gujarat, and southern Uttar Pradesh. The elevation of this region is not high, between 150 to 300 m. This area has many protected areas, mainly in the hilly regions, but the *Lasiurus indicus* dry grassland of the Thar desert is under-represented in the PA system. These grasslands are extremely important for the survival of certain bird species.
 - ***Phragmites - Saccharum -Imperata* Type:** These types of grasslands cover about 2,800,000 km² in the Gangetic Plains, the Brahmaputra Valley and the plains of Punjab and Haryana. The elevation of this region between 300 to 500 m. The Gangetic Plain is one of the most thickly populated regions in the world so original grassland type is almost gone. Some wet grasslands survive in protected areas of the *terai* region and the Brahmaputra floodplains. These wet grasslands harbour many globally threatened wildlife species.
 - ***Themeda - Arundinella* Type:** These grasslands cover about 230,000 km² and include the states of Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Uttar Pradesh and West Bengal. The elevation ranges between 350 and 1200 m.
 - **Temperate - Alpine cover:** These are spread across altitudes higher than 2100 m and include the temperate and cold desert areas of Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh, West Bengal and the north-eastern states. These high altitude grasslands harbour wildlife not generally found in other parts of the country. This area is also under-represented in the PA system.
- The phenology and diversity of grasses vary with topography, rainfall and type of soil. Therefore, depending upon the biotic influences and local variations in topography and soil structure, these five broad categories which was given by Dabardghao and Shankarnaryanan (1973) is further subdivided into several categories of grassland associations (Singh and Joshi, 1979). The climax grasslands are supposed to be absent in India (Whyte 1964, Blasco, 1983), but grasslands as secondary stage are common (Champion and Seth, 1968). Therefore, they have been called as disclimax (Misra, 1946), or pre-climax (Champion and Seth, 1968) or sub-climax (Singh *et al*, 1985). However, Rodgers (1986) has named the grassland of India as anthropogenic or Savanna.

In India, grasslands are mainly found in Gujarat, Rajasthan, Maharashtra, Western Madhya Pradesh, Uttar Pradesh and Brahmaputra valley. Gujarat is situated in the West Coast of India. The state is bounded by the Arabian Sea on the west, Pakistan and Rajasthan in the north and northeast respectively, Madhya Pradesh in the

South East and Maharashtra in the South. The state has a great diversity of physiographic, climate and hydrology. There is a hilly eastern belt with relatively thick forest, particularly in South Gujarat; an arid region in the north and north-west of the state; long sea coast of 1,600 km with two gulfs and plains in the central region and some parts of the South. Gujarat situated between 20° 6' and 24° 7' N latitudes and 68° 10' and 74° 28' E longitudes. Physiographically, Gujarat can be divided into different regions, viz. North Gujarat, Central and South Gujarat and the Eastern Tribal belt.

On the basis of the geographical features Gujarat can be divided into four regions, namely-

North Gujarat region

South Gujarat region

Saurashtra peninsular region

Kachchh region, which is partly desert and partly marshland

Across the state four different climatic conditions exist, namely, extremely arid, arid, semi arid and humid (sub-humid tropical monsoon style) (ISRO, 2010). Hence Gujarat can be considered as unique state that has many kinds of habitats. These varied landforms include dry deciduous forests, majestic grasslands, wetlands, marine ecosystems and rich moist deciduous forests.

In Gujarat, mostly the areas covered by the Grasslands are Saurashtra and Kachchh (Jadhav *et. al.*, 1998). But in the past few years the grasslands have started to expand in the Center and North-East Gujarat also. In Gujarat, the grazing requirements of the livestock are met from grasslands, forests, gauchers (village grazing land) and fallow lands. The grasslands, wastelands and gauchers are known as Common Property Resources (CPRs). Interestingly, the CPRs, which have an access for grazing, are gradually declining. They were 61.4 per cent of the land area in Gujarat during 1961-62 and decreased to 50 per cent in 1992-93 (Parikh and Reddy, 1997). In the 21st century, the main scientific challenges is to understand the extent of biodiversity change that results from human expansion and whether this change is detrimental to the functioning of the biosphere and the well being of human society (Dirzo and Raven, 2003; Naeem, 2009). Human activities, their behavior and economy must be explicitly incorporated into the equation to be able to achieve a more sustainable future. Land cover change and loss of habitats is the core of estimates for global and regional extinction rates (Lawton and Mag, 1995; Pimma *et al.*, 1995; Pimm and Raven, 2000). Due to the globalization and human activities, the forest and grasslands area will be highly reduced over a period of years.

Forest Department maintained about 1400 km² area of Gujarat as grasslands, of which 1295 km² is located in Kachchh and Saurashtra region of the State (Rahmani, 1997). The grasslands are called as 'vidis' in Saurashtra and central Gujarat while 'rakhals' in Kachchh. There are two kinds of 'vidis'; reserved and non-reserved vidis. The former is better-protected grassland, where, the grasses are harvested only after monsoon while the non-reserved vidis are less protected and grasses are harvested anytime depending on necessity and availability. In all, there are 166 reserve vidis in the state covering an area of about 759 km². Of these, 159 vidis

covering a total area of 709 km² are located in Kachchh and Saurashtra regions while the remaining are in Panchmahal district of the state. The non-reserved vidis extend to an area of about 635 km² (Rahmani, 1997). Besides these, there are a number of 'gauchar lands' (village grazing lands) available in the State.

Panchmahal district of Gujarat is located in the Eastern part of the state and has a 5220 sq. km area i.e. 7.29% of district geographic area. Dahod is a district of Gujarat bounded by Panchmahal in West, Vadodara in South, Jhabua district of Madhya Pradesh in the East and Banswara district of Rajasthan in the North and has a 3646 sq. km. area i. e. 4.14% of district geographic area. Forest divisions of Gujarat which are Baria and Godhra falls under Dahod and Panchmahal districts respectively.

The grass family, scientifically known as Poaceae or Gramineae is a 5th largest family after Asteraceae, Leguminosae, Orchidaceae and Rubiaceae of flowering plants in the world (Tzevlev and Michaelova, 1989). The family Gramineae is distinguished by characteristic morphological features including sheathing, ligulate leaves with distinctive epidermal features and flowers in spikelets, glumes, palea, lemma and caryopses. The grasses are not closely related to other families of monocotyledons.

Grasses range from tiny inconspicuous herbs less than an inch to the giant bamboos that grow up to 130 feet tall. It is difficult to calculate the exact number of species of family Poaceae; however, according to Tzvelev (1989), Poaceae consists of 11,000 species (Osborne, 2010) belonging to 898 genera. In India, it is represented by about 1200 species belonging to 268 genera (Karthikeyan *et al.* 1989; Moulik, 1997).

Robert brown (1814) was first to recognize two scientific subdivisions of Poaceae: Pooideae and Panicoideae on the basis of difference between the spikelets. After that Bor (1960) classified the family Gramineae (excluding Bambuseae) into two groups: Panicoideae and Pooideae following Brown (1814). And the group Panicoideae was further divided into three tribes and group Pooideae into thirty seven tribes. The grass family is first and pioneering work of Metcalfe (1960) in a series of volumes on the "Anatomy of the monocotyledons".

Morphology of the grass plant can be conceptualized as a hierarchical arrangement of structural subunits or modules (Briske, 1991). The perennial grass plant is a collection of tillers that arise from a single crown and are of the same genotype as the primary tiller. Each tiller is composed of a series of phytomers differentiated from a common apical meristem (Langer, 1979; Robson *et al.*, 1988). Although there is debate as to what constitutes a phytomer (Clark and Fisher, 1987), it is usually defined as a leaf blade and sheath, the internode, the node, and the associated axillary bud below the point of sheath attachment (Briske, 1991).

The study of human knowledge is as old as human history itself. The study and documentation of human knowledge in terms of traditional knowledge is known as socioeconomic study.

Forest is both ecological as well as economic resource. Forests are home to 50-90% of earth's species and are potentially renewable resources if used as per optimum needs and ensuring their security as per sustainability. The functions of a forest may be broadly classified into three categories protective, productive and

regulatory functions. The socio-economic conditions, the poverty, the illiteracy, unemployment and under employment prevalent in the villages adjoining to the forest forced the people to use the resource as economic resource and never gave an opportunity to think of ecological relevance of the resource in the area. Efforts by the forest department to protect the resource in isolation resulted into conflicts with the locals and more damage to the forest resource leading to the degradation of the land resources.

The contribution of uncultivated wild plants for livelihood support will depend largely on individual circumstances (Agrawal, 2001). The grassland biome which includes a wide range of ecosystem types from humid priaries to arid shrub grass steppes, has been subjected to particularly intense pressure for the production of food and fibres (Ahmad *et al.*, 2009). These plants can provide an opportunity for cash generation. Value addition may be possible to the collected uncultivated foods if they are processed into edible foods prior to the scale.

Many wild plants have significant economic value. By preventing the need for cash expenditure, and income derived from the collection and sale of these resources is particularly important for the rural poor as a source of cash. Some wild plants are important elements for regional identity.

Gujarat state harbors nearly 4,320 plant species which accounts for almost 9.33% of the total floral wealth of India (Blatter and McCann, 1936). The tribals in the state use about 750 medicinally important and 450 economically important plant species. The eastern part of Gujarat has been exclusively studied with respect to ethanobotanical and medicinal values of various plant species (Clayton and Renvoize, 1986; Cope, 1982). More than 61 million people of different ethnic groups following varied religious beliefs live in the Gujarat state, which accounts for 14% of state population. Tribal populations of Bhil, Dhodiya, Kolcha, Koli, Konkni, Gond, Gamit, Valvi, Talvi, Padhar, Pateliya, Rathava, Siddi, Waghri, etc. spread over 8 districts, predominantly inhabit the forest areas all along its Southeastern boundary. These tribal people mainly depend on forest for their shelter, housing material, food, fuel, fiber and feed. Traditional knowledge accumulated generations to help peoples protect their nutrition and health and manage their habitats (Dabadghao and Shankamarayanan, 1973). The possibility that traditional knowledge may be rapidly and widely lost in response to globalization has become a major concern of scholars and policy markers (FAO, 1999; Gandhi *et al.*, 2011).

Seeds are vital part of life on earth. They are fundamental part for plant reproduction. Seeds have various uses out of that many seeds are playing an important role in the diet of human and domestic and wild animals. Seeds provide numerous morphological characters and can be used for taxonomic purposes. Gaertner (1788, 1791) was the botanist who published the first works devoted to the identification of fruits and seeds. Heywood and Davis (1963) emphasized that the use of seed characters can be reliable and constant within taxa. Differences in seeds between genera are sometimes striking and may provide important generic characteristics (Wanger *et al.*, 1984). The taxonomic history clearly shows the

difficulties which exist in recognizing natural supragenic groups (Jacobs and Everett, 2000; GPWG 2001; Liu and Zhao, 2004).

Knowledge of the appearance of seeds, its morphology, is of great importance of botany and seed identification in relation to seed testing, quarantine work, forensic work, seed poisoning and studies of seed dispersal, seed banks and archaeobotanical studies. The most useful factor of seed identification is that it always important in farming, has become even more essential in modern scientific agriculture, without it there would be little merit in perfecting methods of growing useful plants (Martin and Barkley, 1961). The crop harvesters and the conservationists, whose ideas of undesirable differ somewhat according to their aims; a continual war is being waged against plants that are unwanted for one reason or another.

The term seed must be understood in its broad sense. It is applied not only to true seeds, but also to equivalent structures which look like and function as seeds. External features of seeds and small fruits tend to be neglected in Floras, and even in detailed taxonomic studies, which is surprising in view of the stability and high systematic value of external characters (Lawrence 1951, Barthlott 1981, 1984). Differences in seed architecture have proven useful in tracing relationships and postulating hybrid origins for some variants (Chuang *et al.*, 1983).

Sometimes only one clue, if extreme and unique, serves alone to identify a seed but more commonly, several different features in combination are required for a positive and perfect determination. Mostly a seed can be identified to the species as reliably as can the whole plant from which it was obtained. The most useful clues for recognition of seeds are usually the shape, the size and peculiarities of surface features and coloring.

The seed coat is the outer covering of every mature seed. It is therefore the main modulator of interactions between the internal structures of the seed and the external environment. Most seed coats exhibit complex and highly diverse morphology and anatomy, providing valuable taxonomic characters (Barthlott, 1981, 1990). The importance of microstructural pattern analysis of the seed coat observed under stereoscopic and scanning electron microscopy, as a reliable approach for resolving taxonomic problems, has been well recognized (Bogdan, 1966; Heywood, 1971; Barthlott, 1981; Koul *et al.*, 2000). These characters, especially the microstructural features of the seed surface, can be useful for assessing phenetic relationships and delimiting taxa at various levels (Hufford, 1995; Karcz *et al.*, 2000). This seed coat morphology provides strong support for the delimitation of several taxa, especially at the specific level, but the significance of these characters in delimitation of natural groups at the generic or subgeneric level (Moazzeni *et al.*, 2007). Most systematists agree that data concerning the macro- and microstructure of seeds are very significant for the classification of Angiosperm taxa. Seed morphology has been proven to be a valuable feature in many systematic studies, particularly with the application of SEM (Hill 1976; Mathews and Levins, 1986). Heywood (1971) drew attention to the importance and impact of Scanning Electron Microscope in the study of systematic problems by using this technique. Recently, the application of SEM in the study of the seed coat has become wide spread (Brisson & Peterson, 1976,

1977; Mulligan & Bailey, 1976; Stork *et al.*, 1980). Seed SEM characters are relatively consistent for a plant species and may thus prove useful in distinguishing different species and also in grouping them under definite categories (Agrawal, 1984). Few Scanning Electron Microscopic (SEM) studies have been concerned with fine structural differences in taxonomic and morphological features of closely related species, especially within groups of plants of the identical species (Qing liu, 2005, Joshi *et al.*, 2008). Seed surface are also characterized by a secondary sculpture (Barhlott, 1984). Closely related species often have greater similarities compared to species belonging to different genera and families, which makes differentiation within a genus a difficult task. In such cases SEM play a major role (Joshi *et al.*, 2008). During the past decade, SEM studies of small seeds have contributed significantly to the systematic of various angiosperms, for example, Wiffin and Tomb (1972) on Melastomataceae, Hill (1976) on *Mentzelia*, Seavey, Chuang and Heckarel (1972) on *Cordylanthus*, etc.

Color, size and ornamentation of seeds provide important characters to distinguish some taxa (Brochmann, 1992; Koul *et al.*, 2000). Seeds from different genera have different size of embryo, some have large embryo while some have small embryo (Reeder, 1957) which is important taxonomic character. The seeds with have large embryo have less portion of endosperm while the seeds with small embryo have more portion of endosperm. Sometimes embryo occupies fully length of seeds. The relative size of embryo in relation with seed has definite taxonomic value.

Seed surfaces vary from smooth to glossy to dull or rough; surface irregularities include pitting, grooves, furrows, hairs and the other types of sculpturing.

Haber *et al.* (1969) did the extensive study of the seed morphology of the monocotyledons deals largely with internal seed structure, not with all detailed surface micro structure such as is observed with the SEM.

Wanger *et al.* (1984) did work on 16 species of *Hesperantha*. He concludes that seed structure is useful to understand evolutionary process. These studied species are able to separate on the basis of shape and cellular structure of the seed surface. Kanwal *et al.* (2009) studied 8 species distributed in 7 genera of family Aizoaceae. Zhang *et al.* (2005) studied on seed morphology of tribe Hyoscyameae. They conclude that the variation corresponds to the characters of gross morphology, palynology, geographical distribution and molecular sequence data being collected for studied taxa. Seed coat pattern of several species of family Brassicaceae had been studied by different authors and they conclude that seed coat pattern as a parameter for species identification. The results suggest both a close relationship between various taxa (Bengoechea and GoÂmez-Campo, 1975; Mulligan and Bailey, 1976; Buth and Roshan Ara, 1983; (Schulz, 1936; GoÂmez-Campo, 1980, 1999; Warwick and Black, 1993a, 1994, 1997; Koul *et al.*, 2000).

The grass fruit is termed a carocypsis because the pericarp is bonded to the seed wall. In grass carocypses, the pericarp and testa are adherent and must be studied together (Nesbitt, 2006). The distinctiveness extends to the carocypses with their

abundant starchy endosperm and laterally placed embryos. Hilum is present on ventral surface because it is point of attachment of the funiculus to inner ovary wall.

Caroyopsis is similar to an achene because both are dry indehiscent fruits. The pericarp is adnate to the seed coat in the caroyopsis. Even though the pericarp is free in some grasses, these fruits are not considered achenes, but rather the free pericarp represents a modification of the caroyopsis. Identification of grass caroyopses (grains or seeds) is complicated by a large number of genera and species in the family, by considerable overlapping in caryopses characteristics of different tribes and genera and by fact that the seeds may be either enclosed in lemma and palea of the floret or naked. Grass seed morphological features and surface patterns have been used in many studies to identify and compare taxa and genera (Hillman 1916; Jensen 1957; Bogdan 1965; Benerjee *et al*, 1981; Colledge 1988; Matsutani 1986; Terrel and Peterson 1993 and Nesbitt 2006).

Terrel and Peterson (1993) studied on caryopsis morphology of tribe Triticeae. The purpose of their study was to evaluate the morphological structure of the caryopses within the Triticeae. And they conclude that the tribe Triticeae can be divided into two major subtribes and one monogeneric tribe.

For the family Gramineae, attempts have been made for the tribe Chlorideae, for lead to address phylogenetic relationship, mainly on the basis of morphological and molecular data (Hilu and Wright, 1982; Hilu and Alice, 2001). Liu *et al* (2005) studied on 58 species representing 45 genera of tribe Chlorideae and revealed that Chlorideae allows recognition of three major types of caryopsis on the basis of differences in ventral surface and hilum morphology. Hoagland and Paul (1978) compared caryopsis of *Oryza sativa* varieties including the weed red rice and several cultivars. They revealed the seed surface of red rice and Mochi-Gommi possessed trichomes that were more numerous at the seed apex than on the other seed parts. Reimer (2006) studies on *Danthonia* (of North America sp.) caryopses and observed reticulate pattern on the surface of caryopses ovoid to obovoid shape, liner hilum and straight or undulating. Osman *et al*. (2012) studied on fruits morphology of annual grasses from Egypt. They studied 33 species belongs to 24 genera and 11 tribes. They diagnosed the seeds majorly basis of the three characters: fruit shape and seed surface topography. They did their study by using light microscopy and scanning electron microscopy.

Seedling of grasses is difficult to identify, because they were have vegetative features only and grasses mainly identify when they become mature. So concentrate on the vegetative characters in seedling stage. In the present study characteristic features of the grass seedlings have been analyzed.

A seedling comes into being when a seed germinates, but the point at which it ceases to be a seedling is much less clear (Fenner,1987). Seed and seedling traits vary

strongly across the tropical forest biome to cope with the variations in the distribution and amount of rainfall, light, temperature and soil nutrient regimes. Seedlings of monocots are much more diverse than those of other angiosperms, often with much derived character. This makes morphological interpretation difficult (Tillich, 2007). Seedlings are very helpful for the different studies related to Genetics, Physiology, Ecology and Biochemical analysis. A seedling is helpful in assessing the natural regeneration of an ecosystem and is of great importance to the forest planners. Recognition of plants by their vegetative characters is essential in the development of a sound pasture-improvement program. In this program, the first step is to recognize the pest. Control measures depend upon accurate identification. Grasses occurring as weeds are difficult to be identified in their vegetative stage. Many grasses do not flower until late in the growing season. By this time they already have had an impact on the associated growing crop yields. Removal of grass seedling at an earlier stage is important because smaller grasses are easy to be removed and they require very small dosage of herbicides. So greater control can be achieved while minimizing control costs.

A seedling is a plant from seed and not by vegetative reproduction. The seedling is in most cases used to refer to very young individuals. The height and size of seedling are often unsuitable for identifying it, but these measures are important for the general impression the plant makes. Seedlings of tree species are very easily identifiable while grasses and herbaceous plants are very difficult to identify at seedling stages, particularly in the one- to- two-leaf seedling growth stage. For the perfect identification of grasses flowering condition is needed (Fishel, 2004).

McAlpine (1890) reported identification of grasses by their leaves. The first attempts to study the grasses in their flowerless and anatomical characters were by Jenssen (1983) as rightly indicated by Ward (1901). Carrier (1917) compiled a key for 48 common grasses in Eastern United States and it proved of more practical value for the field work than other available key. Later on Henning (1930), Whyte (1930), Burr & Turner (1933), Hitchcock (1936), Undersander *et al.* (1996), Bradley *et al.* (2010) identified grasses at their mature stage before flowering on the basis of the vegetative characters. Nowosad *et al.* (1942) bulletin on the identification of certain native and naturalized hay and pasture grasses and Phillips (1962), field manual on the identification of grasses describes the identification of few grasses of North Eastern part of Canada by their vegetative characters. The main characteristic features used by them are bud shoot, vernation, collar, ligule and auricle. However in these studies the information has been restricted to only a few numbers of grasses.

Durgan (1999) proposed a identification key for some of the broad leaf and grass weed seedlings. Wintel *et al.* (2009) studied few seedlings of subtropical perennial grass species of Western Australia e.g., *Panicum maximum*, *Chloris gayana*, *Pennisetum dandestinum*, *Setaria sphacelata*, *Setaria splendid*, *Urochloa brachiaria*, *Digitaria eriantha*, *Panicum coloratum*, etc. Jian-Guo *et al*(1993) studied seedling characters of 201 species of Gramineae from Australia and China and they grouped these species in 4 clusters.

Our literature reviews and consultation with agrostologist, foresters have not found a compendium of seedlings of native grass species morphological characteristics. Morphological properties of the seedlings, particularly shape of the first leaf, have been examined systematically by Avdulov (1931), Prat (1936), and Kuwabara (1960, 1961). Looman (1982) studied 107 grasses of the rangelands of the Prairie Provinces of Canada and proposed key for the identification of these grass species. Harries (2010) identified and proposed a key to the identification of 50 grass seedlings of Oklahoma grassland. These studies have been supplemented with line diagrams showing the diagnostic features of identification.

From the systematic point of view several workers have analyzed features of grass seedling. To identify the grass seedling, first feature to be checked is to see whether the grass is sod forming (spreading) or bunching (forms clumps).

There are several other features which can be used for the identification of seedlings. First, the life cycle is considered which is very important for collecting seedlings from the field. It will enable an easy identification and collection because some grasses which will not be present at certain time of the year can be easily eliminated from the list during that particular period of collection. Thereafter, there are other features like collar, node, ligule, auricle, culm, leaf surface, leaf tip, stem etc. which can to be considered. The shape of the stem is another feature that is easy to determine. Most grasses have round stem, but some have distinctly flat stems. Most of the identifying characteristic features are confined in collar region of the grasses, which can be seen by carefully pulling the leaf blade back from the stem (Fishel, 2004). Ligule which is present at the base of leaf blade, may or may not be present in all the species. If present they appear as small projection that appears at rim or tuft of hairs or membranous at the base of leaf blade. Besides these features, some grass species have auricles, which are small finger like projection at the base of leaf blade, it clasping the stem at the collar region. The external surface of seedling organs may contain some hairs, glands, scales, prickles, cystoliths, dots, etc.